

Title	Warming and Ocean Acidification Effects in the Seaweed Community of West Spitsbergen
Author's full name	Francisco JL Gordillo, Concepción Iñiguez, Mark Ölschlager, Raquel Carmona and Carlos Jiménez
Author's affiliations	Dep. Ecology, Faculty of Sciences, University of Malaga (Spain)
First author's email	gordillo@uma.es

Global change-related warming and ocean acidification (OA) are major threats to the Svalbard coastal ecosystem. Rock bottom areas are mainly dominated by dense forests of a multi-species community of seaweeds. Different species are shown to respond to warming and OA in different ways and degrees, posing a potential shift in community structure as the new scenario develops. An increase in CO₂ is shown to modify the carbon balance of two representative species in opposing ways. Growth rate of *Desmarestia aculeata* was negatively affected by CO₂ enrichment, while *Alaria esculenta* was positively affected, as a result of a different reorganization of the cellular carbon budget in both species. *D. aculeata* showed increased respiration, enhanced accumulation of storage biomolecules and elevated release of dissolved organic carbon, whereas *A. esculenta* showed decreased respiration and lower accumulation of storage biomolecules. Moreover, incubation of 6 species from Kongsfjorden at different CO₂ and temperature levels indicated that temperature affected mainly the photosynthetic performance as measured by PAM fluorescence, particularly the initial slope of ETR curves, the light saturation parameter (E_k), and F_v/F_m values, as well as the protein content, especially in the phaeophytes. On the other hand, CO₂ affected mainly the internal accumulation of carbohydrates and lipids. The C:N balance was largely unaffected. The resulting growth rate was not altered by the treatments in three out of the six species studied. For example, *Phycodris rubens* showed a positive effect of increasing temperature, while *Saccorhiza dermatodea* was positively affected by CO₂. Significant interactions between CO₂ and temperature were found in 20 % of the analyses. Whether additive or synergistic, the co-occurrence of a higher temperature with other stressors such as elevated CO₂ increases the probability of community changes by modifying the performance of these species. To test whether this kind of responses was characteristic of Arctic populations, *Saccharina latissima* from Kongsfjorden was compared to the population from Helgoland (Germany). Ecotypic variations were revealed by a significantly higher O₂ production rate and an increase in Chl a, Rubisco, and D1 protein content in the Arctic population thalli, but a lower growth rate, in comparison to the Atlantic population. At 10 °C, the Arctic population had a higher content of total C, soluble carbohydrates, and lipids, whereas the N- and protein content was lower. Conclusively, the Arctic ecotype was more resilient to increased CO₂ than the temperate one, and both ecotypes differed in their response pattern to temperature. Overall, Arctic ecotypes of seaweeds have shown an array of responses pointing to an altered community as the “atlantification” and acidification of the West Spitsbergen coastal system take place. Further research will focus on potential alteration of the nutrient regime due to increased discharge from land and its consequences on seaweeds metabolic performance.